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The Ovarian Cell

Its Origin and Characteristics

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THE OVARIAN CELL; ITS ORIGIN AND CHARACTERISTICS.

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In fulfillment of a promise, made at our last meeting, this paper has been written in reply to the remarks of Dr. Garrigues on the ovarian cell.

It will be remembered that in his article on "Exploratory Puncture of the Abdomen," in describing the histological elements which are found in a "Myxoid Proliferous Cystoma," or multilocular ovarian tumor, he made the following statement[1]:—

"Besides epithelial cells ovarian fluid contains usually a large number of free nuclei; some of them have dark granules, others shining. The latter are the corpuscles known in this country as Drysdale's corpuscles. Dr. Drysdale described them himself under the name of 'granular ovarian cells.' They are small, roundish, or slightly angular (*i. e.*, globular or polyhedral) clear bodies with a small number of shining granules placed at some distance from one another. They have no nucleus, nor does any appear by the addition of acetic acid. Their size ranges from a little below a red blood corpuscle to a little above a pus corpuscle. In appearance they are entirely like the *pyoid bodies* described and delineated by Lebert, who, as early as 1846, indicated the test with acetic acid as characteristic of them, but Lebert says he found these bodies in the peritoneum, in the synovial membrane of the knee, in congestive and metastatic abscesses, and often mixed with common pus corpuscles,

[1] *American Gynecological Transactions*, 1881, vol. vi., p. 54.

both in extravasations and in the false membranes seen on mucous and serous membranes. In ovarian fluids these bodies were first described and delineated in 1852 by John Hughes Bennett, with indication of the effect which acetic acid has on them. They are not cells but nuclei."

"Dr. Drysdale has himself pointed out the fact that they never have a nucleus, which is quite natural if they are themselves nuclei. These nuclei are in a state of fatty degeneration as seen by the clear, highly refracting globules in their interior. They are never found in the quite young, microscopical cysts, developed in the wall of larger cysts, while we seldom miss them in the latter. In Case XXXII. I was able to observe directly the identity of Drysdale's corpuscles, the colorless corpuscles with fine dark granules, and the nuclei of the epithelial cells. The fluid contained flakes large enough to be visible to the naked eye. Some of these showed still indistinct outlines of cells, some of which contained nuclei in every respect identical with the Drysdale corpuscles found in the surrounding fluid. In others, most of the cells were no longer recognizable as such, having been dissolved and blended together into a thready mass with holes in it. In this mass and in these holes were found nuclei, — some with fine dark, others with shining, granules. In a few places this nucleus could still be seen embedded in its cell, or a cell was seen without nucleus, but full of large, shining granules, in other words, changed into a large Bennett's corpuscle. I have followed the same process in the walls of minute microscopical cysts. When we examine them at their very first appearance, when a cavity begins to be formed in an epithelial pouch, we find that they contain exclusively colorless corpuscles without shining granules, and corresponding entirely in size and shape with the nuclei seen in the surrounding epithelium. In these minute cysts, then, a melting process is going on. The bodies of the epithelial cells are dissolved by what appears to be a colloid degeneration, and the nuclei set free. In secondary cysts as large as a hazel-nut, I have found large masses of the epithelial lining thrown off, and forming flakes

in the fluid. In due time these are also dissolved, producing a colloid fluid, and the nuclei become free. Later, these may undergo fatty degeneration, and then we have Drysdale's corpuscles."

"These bodies are not only not pathognomonic of ovarian cysts, but they do not even prove that the fluid examined has been taken from any kind of cyst. I have found them in a cyst of the broad ligament, in a suppurating cyst of the abdominal wall, in a case of cancer of the peritoneum, in a renal cyst, and in a vaginal cyst; and similar observations have been made by others. On the other hand, I have looked in vain for them in six cases of ovarian cysts. The result of my researches is, then, that there is *no pathognomonic morphological element* in the fluid of ovarian cysts."

In order to contrast these statements and conclusions with my own, and to point out clearly how they differ, I will make some extracts from a former paper. After stating that my remarks apply only to fluids removed from the abdomen by tapping, and describing the microscopic characters of ovarian fluids, I proceed: "*But no matter what other cells may be present or absent, the cell which is almost invariably found in these fluids is the granular cell.*" [1]

"This granular cell, in ovarian fluid, is generally round but sometimes a little oval in form, is very delicate, transparent, and contains a number of fine granules, but no nucleus. The granules have a clear, well-defined outline. These cells differ greatly in size, but their structure is always the same. They may be seen as small as the one five-thousandth of an inch in diameter, and from this to the one two-thousandth of an inch; in some instances I have found them much larger, but the size most commonly met with is about that of a pus cell.

The addition of acetic acid causes the granules to appear more distinct, while the cell is rendered more transparent. When ether is added the granules become nearly transparent, but the aspect of the cell is not changed. This granular cell may be distinguished from the pus cell, lymph

[1] Atlee, *Diagnosis of Ovarian Tumors*, Philadelphia, 1873, p. 458.

corpuscle, white blood cell, and other cells which resemble them, both by the appearance of the cell and by its behavior with acetic acid.

The pus and other cells which have just been named are often distinctly granular; but the granules are not so clearly defined as in the granular cell found in ovarian disease, owing to the partial opacity of these cells; and when the granular cell of ovarian disease and the pus cell are placed together under the microscope, this difference is very apparent. In addition to the opacity of these cells, we frequently find their cell wall wrinkled rather than granular; and further, in the fresh state, they are often seen to contain a body resembling a nucleus.

But if there is any doubt as to the nature of the cell, the addition of acetic acid dispels it; for if it is a pus cell, or any of the cells named above, it will, on adding this acid, be seen to increase in size, become very transparent, and nuclei, varying in number from one to four, will become visible. Should the cell, however, be an ovarian granular cell, the addition of this acid will merely increase its transparency and show the granules more distinctly. This ovarian granular cell I consider as diagnostic of ovarian dropsy, and have seldom failed to find it in this fluid.

"The compound granular cell, the granule cell of Paget and others, or inflammation corpuscle of Gluge, is also occasionally present in these fluids, and might possibly be mistaken for the ovarian granular cell; but it is not difficult to distinguish them from each other. Gluge's cell is usually much larger and more opaque than the ovarian cell, and has the appearance of an aggregation of minute oil globules, sometimes inclosed in a cell wall, and at others deficient in this respect. The granules are coarser and vary in size, while the granules of the ovarian cell are more uniform and very small. Again, the behavior of these cells on the addition of ether will at once decide the question; for while the ovarian granular cell remains nearly unaffected by it, or at most has its granules made paler, the cell of Gluge loses its granular appearance, and sometimes entirely disappears through the solution of its contents by the ether."

In another place[1] the ovarian cell is spoken of as "A cell which I have named the ovarian granular cell, to distinguish it from all other cells found in abdominal dropsical fluids; not meaning to assert that a cell having a similar appearance may not be found in cysts met with in other parts of the body. This cell, when found in this location, I believe to be pathognomonic of ovarian disease, and as such its diagnostic value cannot be overestimated."

Again, "A full and accurate description of this ovarian granular cell has, therefore, never been published, to my knowledge, except by me, nor any tests given by which to distinguish it from others, such as the pus cell, white blood corpuscle, and the compound granule cell, which often closely resemble it. This renders all descriptions of granular cells seen in ovarian fluids, heretofore given, of little value, as these last-named cells are frequently found in fluids removed from the abdomen, which might, on that account, be considered ovarian."

"I claim, then, that a granular cell has been discovered by me in ovarian fluid, which differs in its behavior with acetic acid and ether from any other known granular cell found in the abdominal cavity, and which, by means of these reagents, can be readily recognized as the cell which has been described; and further, that by the use of the microscope, assisted by these tests, we may distinguish the fluid removed from ovarian cysts from all other abdominal dropsical fluids."

The two statements in regard to the ovarian cell may be summarized as follows: —

I assert: 1. That a cell, called the ovarian granular cell, is almost invariably found in the fluid of ovarian cysts.

2. That this cell may be distinguished from the pus cell, lymph corpuscle, white blood, and other cells which resemble them, both by the appearance of the cell and by its behavior with acetic acid.

3. That it has been named the ovarian granular cell to

[1] *Transactions of the American Medical Association*, 1873, vol. xxiv., p. 179.

distinguish it from all other cells found in abdominal dropsical fluids; not meaning to assert that a cell having a similar appearance may not be found in cysts met with in other parts of the body.

4. That this cell, when found in this location, I believe to be pathognomonic of ovarian disease.

5. That this granular cell in ovarian fluid was discovered by me, and that it differs in its behavior with acetic acid and ether, from any other known granular cell found in the abdominal cavity.

6. That a full and accurate description of this cell has never been published, to my knowledge, except by me, nor any tests given by which to distinguish it from others which often closely resemble it.

On the other hand, Dr. Garrigues asserts: —

1. That the bodies found in ovarian fluids, and known as Drysdale's corpuscles, *are not cells*, as Dr. Drysdale has represented them, but *are nuclei.*

2. That in appearance they are entirely like the pyoid bodies described by Lebert as early as 1846, and that the test for them, as given by him, is the same, *i. e.*, acetic acid. And further, that Lebert has shown that they can be found in various parts of the body.

3. That in ovarian fluids these bodies were first described in 1852 by John Hughes Bennett, with indications of the effect which acetic acid has on them.

4. That these bodies are not pathognomonic of ovarian nor any other cysts, as they may be found in various parts of the body.

It will be perceived that the first and last of Dr. Garrigues' statements merely express a difference of opinion, but the second and third amount to grave charges which I will endeavor to refute.

Whilst our views are antagonistic on all these points, it will be found that in one thing Dr. Garrigues, in common with the most careful observers, agrees with me. He says,[1] "Besides epithelial cells ovarian fluid contains usually a

[1] *Gynecological Transactions*, vol. vi., p. 54.

large number of free nuclei, some of them have dark granules, others shining. The latter are the corpuscles known in this country as Drysdale's corpuscles ;" and again,[1] "The only corpuscles in ovarian fluid I have found it really difficult to distinguish from Drysdale's so-called 'ovarian granular cell' are thorn-apple or rosette-shaped red-blood corpuscles, the knobs on the surface of the latter, seen from above, giving an appearance which is very like that of the shining granules in the interior of Drysdale's corpuscles. But, by paying close attention, we will find the contour of a rosette-shaped blood corpuscle scolloped, while that of Drysdale's corpuscles is even." He thus admits the existence of a peculiar body in ovarian fluids which can be readily identified as the one which I have described as the ovarian cell.

The question, then, is not as to the existence of such a body, but as to its true character and diagnostic importance. That the subject may be fully understood, it will be necessary to give my own views in regard to the origin and charactistics of the ovarian cell before replying to the remarks of Dr. Garrigues.

The reader of my former papers will have noticed that the origin of the cell was not alluded to in them. The reason for this omission was that they were intended to be entirely practical, and as concise as was compatible with clearness of description ; the principal object kept in view being simply to point out such peculiarities of the fluids and cells as could be recognized by other observers. I soon discovered, however, that in making the papers so brief, I had made a mistake. Even experienced microscopists misunderstood what, it was thought, was clearly described. For instance, in an early criticism I was accused of [2] "opening an elementary question in pathology long since settled, and representing as 'ovarian' the ordinary compound granule cell formerly improperly called 'the exudation corpuscle' or 'inflammatory

[1] *American Journal of Obstetrics*, January, 1882, p. 24.

[2] "Proceedings of the Pathological Society of Philadelphia," *Medical Times*, April 12, 1873, p. 445.

corpuscle' of Gluge, and," says the writer, "for some time determined to be nothing but a fattily degenerated cell, in whatever locality found, and liable to be found in any locality." An eminent professor of pathology in Glasgow wrote to me: "I do not quite see how your ovarian cell is to be distinguished from a cell just at the beginning of the process which ends in the compound granular corpuscle;" which proved that he did not understand the matter. Professor Otto Spiegelberg asserted in an article on the subject that I was "not up to the mark of the German researches."[1] Others supposed that I was describing a specific cell like the cancer cell.[2] Others, again, believed that it was merely an altered white blood or pus cell,[3] etc. It may be here stated that many of these writers have since changed their opinion. The author of the first criticism, in a more recent publication, recalled what he had said;[4] while Professor Spiegelberg, in a letter to me, which I have here, promised to correct what he had written. But enough has been adduced to show that what had been published was misunderstood.

In taking up the subject again, after ten years of silence, I trust that I shall be able to make my meaning sufficiently clear to convince you that my descriptions of this body were accurate, that my claim of priority of description was well-founded, and that I was correct in considering it a cell. Having already reproduced the *description* of the cell in the opening of this paper, it will only be necessary to treat of its *origin.*

In examining the inner wall of an ovarian cyst it will be found to have, like the Graafian follicle from which it is derived, an epithelial lining. This lining serves to secrete the contents of the cyst, and is itself constantly undergoing growth and decay. When we remember the enormous amount of fluid produced by these cysts, and the rapidity of

[1] *American Journal of Obstetrics*, November, 1873, p. 353.
[2] *American Journal of the Medical Sciences*, April, 1882, p. 430.
[3] *Ibid.*, April, 1882, p. 432.
[4] *Philadelphia Medical Times*, March 28, 1874, p. 411.

their growth in most cases, it will be readily conceded that they are possessed of an intense vital activity. The cell elements multiply rapidly, and are cast off, *pari passu*, with the increase of the cyst. In this hurried growth a great number of the epithelial cells do not come to maturity, but are thrown off before being completely developed, or, in other words, before a nucleus has formed in them. This rapid growth and shedding is, as is usual in such cases, attended by a partial fatty degeneration of the cells, giving them their granular appearance. Being immediately immersed in the albuminous fluid of the cyst they acquire, by maceration in it, that delicacy and transparency so peculiar to them. In short, the ovarian cell is not claimed to be a new cell, but an epithelial cell in an immature condition, produced in ovarian cysts by reason of their rapid growth. This is the origin of the ovarian cell.

But, it may be said, this is merely a theory of their formation. What proof can be given to show the correctness of this conclusion? The evidence may be found in a careful examination of the epithelial lining of an ovarian cyst, and of the contained fluid. This will reveal epithelial cells in all stages of development. They can be followed from the exceedingly small, aborted cell without nucleus, found in greatest abundance in the fluid, but also found in the epithelial layer, to the fully formed columnar epithelial cell, which, from its firmer attachment to the cyst wall, is often absent from the fluid. The various stages of development of these cells is best observed in a thick-walled cystoma of rapid growth, as it has been found that the fluid of a cyst of slow growth and thin cyst wall contains, as a rule, comparatively few of these cells, while that of a thick-walled cyst growing rapidly holds them in abundance. These gradations have been traced by me repeatedly in the numerous examinations which I have made of these fluids and cysts.

This conclusion in regard to the origin of the ovarian cell can scarcely be regarded as a hasty one, when it is remembered that these investigations were pursued by me for twenty years before a word was published on the subject.

For many of these years I also believed these cells to be the nuclei of the epithelial cells, but repeated examinations of the cyst walls and contents finally convinced me of my error. I was first led to doubt the fact of their being nuclei by the want of correspondence between their size and that of the nuclei of the matured epithelial cells, and from finding some of these bodies nucleated; and further search proved that in a few of them, apparently destitute of a nucleus, one could be discovered by coloring with carmine. Again, the presence of such an abundance of nuclei, if nuclei they were, in the fluid would indicate the existence of cells in great numbers undergoing the process of disintegration and leaving their nuclei comparatively unacted upon. But, although numerous epithelial cells which had undergone fatty degeneration were met with, in most of them the nucleus was still present, and, as a rule, equally degenerated with the rest of the cell. These facts could not be reconciled with the belief that these bodies were nuclei, and further research became necessary. This was undertaken, and resulted in the conclusion, which has been stated, that the ovarian cell is not a nucleus but an immature, or aborted, epithelial cell, which has undergone a certain amount of fatty degeneration.

But Dr. Garrigues in his first statement, and in fact all through his paper, asserts that I have erred in describing this as a cell. "It will be seen," he says, "that I do not regard Drysdale's corpuscles, as he does himself, as cells. I do not see any reason why this corpuscle should be looked upon as a cell, its most distinctive character being never to have a nucleus, while this peculiarity is quite easy to understand when it is itself a nucleus."[1] Or, in other words, if it has no nucleus it is not a cell. Many other writers have held the same opinion as to the nature of this body. Spencer Wells, for instance, in describing the ovarian cell, says, "We suppose these [bodies] to be simply the nuclei of the epithelial cells which line the interior of the cyst. The scales are thrown off, the cell wall breaks down, and the nu-

[1] *American Journal of Obstetrics*, January, 1882, p. 29.

cleus remains." [1] Spiegelberg, and many other observers, also believed this to be true. As this view may be again advanced, even after what has been said in regard to the origin of the cell, and as, in fact, there seems to be a difference of opinion as to what a cell really is, a few words as to its definition will not be out of place.

What, then, is meant by a cell? Must we cling to the old definition, and consider a cell only as such when it possesses a cell wall, inclosing a cavity in which are fluid contents and a nucleus? Modern physiologists take a different view of the matter. Max Schultze takes the embryonal cell as the basis and starting point of his definition. "The most important cells," he remarks, "those in which the fullness of cell life, the unlimited power of tissue formation, is most distinctly evident, are clearly the embryonal cells, which proceed from the division of the cells of the ovum. We may see in these the true archetype of a cell, and yet they only consist of a little mass of protoplasm and a nucleus." [2] "Brücke goes a step farther in his definition of a cell, maintaining that no proof has been given that the nucleus is indispensable to our conception of it." [3] "But if we desire to be logical," says Stricker, "if we do not desire to advance the statement that the non-nucleated bodies of the lower plants and animals and the fertilized ovum occupy an unique and isolated position which is not assumed by any other being in the whole scale of creation, we must exclude the nucleus as an unnecessary factor in the ideal type of an elementary organism. We must also in future apply the histological term cell to the morphological elements of the higher animals or to independent living organisms, even if we are unable to discover anything more in their structure than that they are little masses of animal sarcode or protoplasm." [4]

Carpenter, after describing a perfect cell, proceeds: "But

[1] *British Medical Journal*, January, 1878, p. 883.
[2] *Manual of Histology*, by Prof. S. Stricker, p. 28.
[3] *Ibid.*, p. 29.
[4] *Ibid.*, p. 29.

there is a large number of cases in which the cell shows itself in a form of much less complete development; the 'elementary part' being a corpuscle of protoplasm or 'germinal matter,' of which the exterior has undergone a slight consolidation, like that which constitutes the 'primordial utricle' of the vegetable cell or the ectosarc of the Amœba, but in which there is no proper distinction of 'cell wall,' 'cell contents,' or nucleus. *This condition*, which is characteristically exhibited by the nearly globular colorless corpuscles of the blood, *appears to be common to all cells in the incipient stage of their formation;* and the progress of their development consists in the gradual *differentiation* of their parts, the 'cell wall' and 'cell contents' being separated (as 'formed material') from the 'germinal matter,' which last usually remains as the 'nucleus,' — generally, however, contracting, and sometimes (when its work has been completely done) disappearing altogether.'[1] Am I not correct, then, in naming this a cell, and in considering it an aborted or immature cell in which this differentiation of the parts has not had time to take place?

Having presented the proof that there is such a body as the ovarian cell, and that I have correctly defined it, it will be well to answer a question which naturally presents itself. If this is but an immature epithelial cell, why has it been called an ovarian cell and described as having no nucleus? This question has been partially answered in my first paper. Believing this immature cell to be the one which is characteristic of ovarian fluids, it was named the ovarian granular cell to "distinguish it from all other cells found in abdominal dropsical fluids," or, in other words, for the purpose of identifying it. And, as it was derived from the ovarian cyst, the name was thought to be appropriate. Again, it was described as it existed, not as an epithelial cell, for then a matured, nucleated epithelial cell would have been looked for, but as the peculiar cell which I found only, with one exception, and almost invariably, in ovarian fluids, and which differs so

[1] *The Microscope*, etc., by Dr. William B. Carpenter, London, 1875, p. 734.

widely from the epithelial cell in size, in appearance, and in having no nucleus, that it required patient and long continued search to discover its origin. Although it was occasionally found to have a nucleus, yet this was a rare exception, the greater number, by far, having no nucleus ; therefore the rule and not the exception was described.

I now pass on to examine Dr. Garrigues' opinion in regard to the origin and nature of this body. The first remarks which he makes concerning their origin are contained in the following paragraphs : —

" If, instead of examining old cysts, we direct our attention to the very beginning of the formation of a microscopic cyst in the centre of one of the epithelial pouches which are developed from the epithelium lining the inside of the main cyst (Fig. 29), we find another process. The cavity is still so small that the opposite walls almost touch one another, and it contains exclusively colorless bodies without shining granules (Fig. 21 *a*) and corresponding entirely in size and shape with the nuclei seen in the surrounding epithelial cells. They are only four or five μ. in diameter. In another of these minute cysts (Fig. 30), the cavity of which is a little larger, we find also larger bodies, but still of the same kind, without trace of shining granules. The finely granular bodies are here somewhat larger, either circular with a diameeter of seven μ., or oblong, measuring seven by eleven μ. One of them has a nucleolus. At the same time we notice in the wall a much enlarged epithelial cell with nucleus and nucleolus. This nucleus corresponds perfectly in size and appearance with the bodies swimming in the cavity.

" In these minute cysts, then, a melting process is going on by which the bodies of the epithelial cells are dissolved, and the nucleoli set free. If we examine young secondary cysts which are large enough to form macroscopical tumors, say of the size of a hazel-nut, we may find whole masses of the epithelial lining thrown off and forming flakes in the fluid. In due time these will also be dissolved, and their nuclei set free. The nuclei may later undergo fatty degeneration, and then they become Drysdale's corpuscles." [1]

[1] *American Journal of Obstetrics*, January, 1882, p. 28.

I have searched these paragraphs of his in vain for any evidence of the existence of this "melting process" which he asserts is "going on." If they are read carefully, it will be found to be mere assertion, for not a shadow of proof is offered to show that these epithelial cells are undergoing colloid degeneration or melting. Closely examined, his statement is simply this, — that he has seen microscopic cysts lined with nucleated epithelial cells, and in the fluid of the cysts free bodies of the same size as the nuclei of the cells, and, without tracing any connection between them, he at once arrives at the conclusion that the epithelial cells have melted and liberated their nuclei — a supposition entirely unsupported by facts, for even his drawings afford no evidence of it, but, in truth, serve better to illustrate the description which I have given of the origin of these cells.

Now it must be remembered that in most microscopical observations of these fluids and cysts a very large number of the epithelial cells are visible, and that the number I have seen in over two thousand examinations, made in the last twenty-nine years, must be almost infinite. Then, if the ovarian cell originated in the manner represented by Dr. Garrigues, and this melting process did really exist, it would be impossible not to have seen some cells undergoing the process and in the different stages of melting, from mature growth to final decay, and the liberation of the nucleus, but no such observation ever has been made. Even Dr. Garrigues does not assert that he has seen it, and his conclusion that the epithelial cell is melted down, liberating the ovarian cell of Drysdale, is not only without a tittle of evidence to support it, but the negative evidence against the truth of the assertion is overwhelming.

Apparently not entirely satisfied with this explanation of the method by which the nucleus is freed, in another part of his paper, as has been shown, Dr. Garrigues states that the epithelial cell undergoes fatty degeneration, and that in this manner the cell wall disappears, liberating the nucleus. But, it may be asked, what proof is there of the nucleus having a greater power of resistance to the process than the cell itself?

Again, does the cell wall undergo either form of degeneration, and leave the nucleus comparatively untouched? Even Dr. Garrigues does not agree with himself here, for in describing the process of fatty degeneration in the epithelial cells, he says, "*Usually, the nucleus is destroyed,* but it may still be visible." [1]

I have seen the epithelial cells in all stages of fatty degeneration, but, as a rule, the nucleus was similarly affected and undergoing the same destruction. In fact the nucleus is frequently destroyed before the rest of the cell, as is well illustrated in Dr. Garrigues' drawings of the formation of Bennett's corpuscles.[2]

Having shown that in the descriptions which he gives of the liberation of the nucleus by colloid and fatty degeneration no proof can be found of the correctness of his conclusions, I pass on to consider the only remaining evidence of their being nuclei offered, which is contained in the paragraph in which he says, "I was able to observe directly the identity of Drysdale's corpuscles, the colorless corpuscles with fine dark granules, and the nuclei of the epithelial cells." He discovered this evidence in "a very thick, *colloid,* yellow-gray fluid." "In this swam flakes of epithelium large enough to be seen with the naked eye. Some of these flakes showed still indistinct outlines of cells, some of which had a *nucleus* identical with Drysdale's corpuscles in the surrounding fluid. In other flakes, most cells were no longer recognizable as such. They had been dissolved and blended together to a thready mass with large holes in it. In this mass and in these holes were found nuclei, some of the finely granular semi-opaque variety, others with shining granules, *i. e.,* Drysdale's corpuscles. In a few places the nucleus could yet be seen embedded in an epithelial cell, or a cell was found without nucleus, with large shining round granules, *i. e.,* changed to a Bennett's corpuscle." [3]

Let us examine this description. "Some of the flakes,"

[1] *American Journal of Obstetrics*, January, 1882, p. 28.
[2] *Ibid.*, p. 27.
[3] *American Journal of Obstetrics*, p. 31.

he says, "showed still indistinct outlines of cells, some of which had a nucleus *identical* with Drysdale's corpuscles in the surrounding fluid." This again is mere assertion. How does he demonstrate the identity of these nuclei, inclosed in a cell with an indistinct outline, with Drysdale's corpuscles? He does not say that he applied any tests. In fact, how do we know that these indistinct outlines were the outlines of cells? For nothing is more deceptive than the microscopic appearance of a colloid mass.

But admitting that they were cells, and that they inclosed nuclei, does he consider the nuclei identical with the ovarian cell because they resembled them in *appearance?* Then he should be an able judge of the appearance of an ovarian corpuscle. But examine his drawings of nuclei[1] entitled, "Transition from Nuclei to Drysdale's Corpuscles," and then read what follows. "I hold," he says, "most of these bodies to be nuclei of epithelial cells which undergo fatty degeneration. They vary in size from five to sixteen μ., and attain exceptionally still larger proportions. *Some of them are probably colorless blood corpuscles or lymph corpuscles.*" Now even with these cells before him, he acknowledges that he is unable to distinguish what he considers a nucleus, that is, an ovarian cell, from a lymph corpuscle or a white blood cell. How, then, does he identify the nucleus *in* the cell with the free nuclei? He does not enlighten us, but merely asserts that such is the fact.

"In other flakes," he says, "most cells were no longer recognizable as such. They had been dissolved and blended together to a thready mass with large holes in it." To a microscopist this description is, to say the best of it, peculiar. How did he know that the thready mass which he saw in the field of the microscope had formerly consisted of cells? It was mere surmise. To prove it from his account of it is simply impossible. The fact of a few broken down epithelial cells being present certainly did not show that the thready mass had formerly been epithelial cells, but rather the contrary. And the presence of Drysdale's corpuscles,

[1] *Transactions of the American Gynecological Society*, 1881, p. 54.

if such they were, entangled in this mass, indicates nothing but the fact of the fluid being ovarian. He falls short, then, of giving any reliable evidence that these bodies originate in the manner which he represents, and of course fails to prove that they are nuclei.

Believing that sufficient evidence has been advanced to show that I am correct in describing these bodies as ovarian cells, and also that Dr. Garrigues' assertion that they are nuclei is without foundation, I will pass to his next statement, which is, that "in appearance they are *entirely like* the *pyoid bodies* described and delineated by Lebert, who, as early as 1846, indicated the test with *acetic acid* as *characteristic* of them, but Lebert says he found these bodies in the peritoneum, in the synovial membrane of the knee, in congestive and metastatic abscesses, and often mixed with common pus corpuscles, both in extravasations and in the false membranes seen on mucous and serous membranes."

Could a statement be more positive? But to show how utterly groundless it is I will quote Lebert. In treating of pus and its varieties, he says:[1] "The element by far the most important is the one to which we have given the name of pyoid globules, *and that we regard as a variety of pus globules*, with which one often finds them mixed, but from which notwithstanding they differ by several of their chemical and physical characters." He then gives the size, which is almost the same as that of the pus cell. "They are spherical and composed of two elements, of a substance tolerably transparent, of a consistence rather solid than liquid, and of molecular granules varying from four to ten, and beyond, irregularly distributed in their substance; but they never show any nuclei, and the acetic acid above all, in rendering them a little more transparent, never changes them."

If we stopped here the quotation would certainly confirm what has been said by Dr. Garrigues, but we will read on: "They are larger and more spherical than the globules of tubercle, smaller and more granular in their substance than the white globules of blood, from which they differ by

[1] Lebert: *Physiologie pathologique*, vol. I., p. 46, Paris, 1845.

another *essential character, their yellowish tint.*"[1] Is this *entirely* like the ovarian cell in appearance? Is not Lebert's statement clear, that they can be distinguished from the white blood cell by their yellow color, and if from the white blood cell, why not from the ovarian cell, which is even more colorless and transparent?

But another important fact in Lebert's description, which Dr. Garrigues appears to have overlooked, is that these bodies are only discovered in pus. Never are they alluded to as being found alone, or apart from pus; they are always spoken of as one of its constituents. Says Lebert, "We had at first believed that they were only met with in the purulent effusions of cachetic individuals, and principally the tubercular, but we are convinced nevertheless that they are present in *many* of *the different kinds of pus*, and in the most diverse constitutions. We have met with this kind in the peritoneum, in the synovial membrane of the knee, in congestive and metastatic abscess. Lastly, we have often found them mixed with the ordinary globules of pus in the extravasations, and in the false membranes of the mucous and serous surfaces." In no place does he say he found them independent of pus — an important distinction, and one apparently ignored by Dr. Garrigues. In short, Lebert states that he found a corpuscle in pus which he could distinguish from the pus cell by the addition of acetic acid, as the acid causes the pus cell to become transparent and reveal its multiple nucleus, while the pyoid body is only made a little more transparent and shows no nuclei, and that the *essential characteristic* of the *pyoid body* is its *yellow color.*

Hence these misleading statements, founded on an imperfect quotation from Lebert, are disproved by Lebert's own words. Nothing is found in his writings to support Dr. Garrigues' assertions, for the mere fact that Lebert discov-

[1] "Ils sont plus grands et plus sphériques que les globules du tubercule, plus petits et plus granuleux dans leur substance que les globules blancs du sang, dont ils diffèrent par un autre *caractère essentiel, leur teinte jaunâtre.*" Lebert: *Physiologie pathologique*, vol. i., p. 46. Paris, 1845.

ered a corpuscle in pus which he could distinguish from the pus cell by the addition of acetic acid does not invalidate my statement that the ovarian cell "can be distinguished from the pus cell, lymph corpuscle, white blood cell, and other cells which resemble them, both by the appearance of the cell, and by its behavior with acetic acid." Dr. Garrigues appears to have also overlooked some remarks of Lebert in speaking of this very cell, which are pertinent to the subject. "It is of the greatest importance," he says, "to be *very exact* in these investigations, which can serve to enlighten several doubtful points of pathology with a nearly mathematical precision." [1] If Dr. Garrigues placed any faith in his statement why does he say, "The only corpuscles in ovarian fluid I have found it really difficult to distinguish from Drysdale's so-called 'ovarian granular cell' are thorn-apple or rosette-shaped, red blood corpuscles, the knobs on the surface of the latter, seen from above, giving an appearance which is very like that of the shining granules in the interior of Drysdale's corpuscles. But, by paying close attention, we will find the contour of a rosette-shaped blood corpuscle scalloped, while that of Drysdale's corpuscles is even." [2]

If in appearance they are entirely like the pyoid bodies of Lebert, and the test, acetic acid, is the same in both, how is it that he finds no difficulty in distinguishing them? Of course Dr. Garrigues does not intend to mislead, but his manner of quoting, so as to cause the reader to infer that these bodies were found in the peritoneum, synovial membrane of the knee, etc., independent of their admixture with pus, certainly seems disingenuous.

Before leaving this part of the subject it may be well to state: —

1. That if an abdominal cyst should be met with which had undergone suppuration we should find in the fluid pus cells in abundance, and, in all probability, many of these pyoid bodies of Lebert. This is also true of the inflammatory effusions in the peritoneal cavity, but the mere fact of the

[1] Lebert: *Physiologie pathologique*, vol. i., p. 47.

[2] *American Journal, of Obstetrics*, January, 1882, p. 24.

presence of the pus cells would put us on our guard, and he would be a careless observer who would be misled by these pyoid cells, even if their yellow color should not be sufficient to distinguish them.

2. That there is a cell which resembles the pyoid cell in some of its characters, but which differs from it in its want of transparency and color. It is granular, but the granules are not distinct, their outlines are not sharply defined. Acetic acid has very little influence on it. But its general appearance will distinguish it from the ovarian cell to a careful observer, and the acetic acid test will differentiate it from the pus cell, white blood cell, etc. I have described this cell in my paper on "Dropsical Fluids of the Abdomen," in the following words:[1] "Specimens of ascitic fluid are occasionally met with containing objects which, in size and appearance, resemble the pus cell, but which show no nuclei on adding acetic acid. Their surface is generally granular, but occasionally is finely wrinkled. They differ from the ovarian granular cell in being semi-opaque, in their not presenting the clearly defined granules of the ovarian cell, and in their being of an uniform size, one two-thousandth of an inch in diameter. These cells are here described particularly, not that they are believed to be peculiar to this fluid, but in order to guard against an error in diagnosis, as they have been mistaken for the ovarian cells." But, as I have shown, there is but little risk of an observer who has an eye well trained to this kind of research mistaking the one cell for the other.

His third statement is even more calculated to mislead than the last. "In ovarian fluids," he says, "these bodies were *first* described and delineated in 1852 by John Hughes Bennett with indication of the effect which acetic acid has on them."[2] This is a direct charge that I have claimed credit for what I must have known belonged to another, as Bennett's writing had been referred to in my first paper.

To sustain this charge, Dr. Garrigues says, "In his clini-

[1] *Diagnosis of Ovarian Tumors*, by W. L. Atlee, p. 451.

[2] *American Gynecological Transactions*, 1881, vol. vi., p. 55.

cal lectures on the 'Principles and Practice of Medicine,' [1] Bennett draws both large granular cells with or without a nucleus, and *small bodies invariably without a nucleus*, which latter are *entirely like Drysdale's corpuscles.* Fig. 172 on page 172 shows very distinctly Drysdale's corpuscles, *after addition of acetic acid* [the italics are Dr. Garrigues'] without nucleus. The text describes them as 'pale, round, and oval corpuscles, the outline of which becomes stronger on the addition of acetic acid.' " [2]

Notice the construction of this paragraph. The reader will get the impression, and it seems to be intended that he should, that the same cell is referred to in the drawing at page 91, and the one on page 172. It reads, " Bennett draws both *large granular cells with* or *without a nucleus*, and *small bodies invariably without a nucleus*, which *latter* are entirely like Drysdale's corpuscles. Fig. 172 shows Drysdale's corpuscles after addition of acetic acid."

What could the reader infer from this, but that Bennett had drawn and described the ovarian cell, and had used the acetic acid test as Dr. Garrigues has asserted? The paragraph is entirely misleading, and is well calculated to deceive. The drawing on page 91 has no connection whatever with that on page 172, and it will be found that they refer to two entirely distinct varieties of cells.

To understand the matter clearly, the paragraph must be separated. The *first* part of it refers to a drawing on page 91. In regard to this, Dr. Garrigues says, " Bennett draws both large granular cells with or without a nucleus, and small bodies invariably without a nucleus, which latter are entirely like Drysdale's corpuscles." But how does he know that they are entirely like Drysdale's corpuscles? Bennett does not describe them, nor even allude to them, certainly he never applied a test to them. Therefore, it is impossible to say what they were. Dr. Garrigues offers no proof, it is a mere assertion.

The fact is simply this: Bennett gave a drawing of some

[1] Second edition, New York, 1858, p. 91, Fig. 70.

[2] *American Journal of Obstetrics*, January, 1882, p. 38.

nucleated cells which he believed were characteristic of ovarian fluid. Mingled with these cells in the drawing are seen a few granular cells and some granular matter, which are almost always present in ovarian fluid, and for this reason were probably sketched by Bennett, but to which he attached no importance, as he does not mention them in his text. The mere fact of his seeing them in the field of the microscope and drawing them proves nothing, for many other observers had done the same thing before him, but *he* also failed to detect their true character. The cells which he did describe, and which he thought were diagnostic of ovarian tumors, were the *large nucleated cells.*

But here are his own words: "The fluid removed by tapping from the abdomen of Jessie Fleming," he says, "contained flocculi which, when examined with the microscope, were found to be composed of numerous cells varying in size from the one hundredth to the fortieth of a millimeter in diameter. The great majority were about the fiftieth of a millimeter. They were slightly granular, of round and oval shape, unaffected by water, but becoming more transparent on the addition of acetic acid, and *exhibiting a distinct nucleus* about the one hundred and fortieth of a millimeter in diameter (see Fig. 170)," [1] the very one alluded to by Dr. Garrigues in support of his assertion. These were nucleated cells, and are the only ones he refers to, which proves that he made no allusion to the ovarian cells, which are destitute of nucleus.

That Dr. Garrigues was aware of this fact may be seen from his own words. In speaking of this very description, he says, [2] "This applies *exclusively to the large bodies* we find in ovarian fluid. He (Bennett) *did not notice* any of the *nuclei* which *are so important a part of this fluid*, and the statements, that the bodies were slightly granular, that they contained a nucleus, and were embedded in a granular matter, apply only to some of these corpuscles, whilst others exhibit quite different characters as shown above. But imper-

[1] *Bennett's Clinical Medicine*, second edition, New York, 1858, p. 700.
[2] *American Journal of Obstetrics*, January, 1882, p. 37.

fect as the description is, it is clear enough to *enable us to recognize the bodies the author describes*, and, as he is the first who has done this, I have in this paper throughout called these *large bodies Bennett's bodies*." Knowing, then, what Bennett referred to, and also knowing that he made no allusion to these small granular cells, yet Dr. Garrigues unjustly attempts to give Bennett the credit of first describing the ovarian cell simply because a few granular cells, the nature of which is unknown, have been included in the drawing.

The *second* part of the paragraph refers to an entirely different cell. "Fig. 172 on page 172," he says, "shows very distinctly Drysdale's corpuscles, *after addition of acetic acid*, without nucleus. The text describes them as pale, round, and oval corpuscles, the *outlines* of which become stronger on the addition of acetic acid." To show how unfair this whole statement is, and to prove that Bennett has reference to an entirely different cell, the colloid corpuscle, which is found in colloid matter, compare this garbled quotation with the context, and see what he really says. In describing cystic growths in general, he observes:[1] "The contents are more or less gelatinous, sometimes slightly so, like weak gelatine, at others firm, capable of being cut with a knife like tolerably strong glue, or firm calves-foot jelly. Sometimes this matter is structureless, at others it may be seen to contain *very delicate filaments, combined with pale oval bodies, the outlines of which become stronger on the addition of acetic acid.* (Fig. 172). This reagent frequently causes the gelatinous mass to coagulate into a firm white fibrous structure, capable of being separated by needles, and presenting all the structure of filamentous tissue. This kind of contents is common in the thyroid gland and ovary, and we have seen it in the kidney and other organs." It is stated in a foot-note that the drawing represents "Delicate oval corpuscles in amber-colored, transparent, *colloid* matter of the ovary."

[1] *Clinical Lectures on Medicine*, by J. Hughes Bennett, second edition, New York, 1858, p. 172.

To call this a description of the ovarian cell is certainly a stretch of the imagination. It is simply that of the cells of colloid matter. Paget [1] depicts them thus: "These, the so-called colloid corpuscles, are small, granular, moderately transparent cells of irregular shape, from one five-thousandth to one two-thousandth of an inch in diameter, with small nuclei or none." A reference to the drawing in Bennett's work will show that they have but little resemblance to the ovarian cell. There is, then, not the slightest proof that Bennett was acquainted with this cell, for, as has been shown, he has never alluded to it in his writings, nor delineated it for the purpose of description. And yet Dr. Garrigues concludes, "There is no doubt that Bennett has known these bodies, but he does not claim that they are characteristic for ovarian cysts" [2]— a conclusion worthy of the erroneous premises upon which it is founded.

That Dr. Garrigues attaches much importance to this statement of the priority of Bennett in this description of the ovarian cell may be seen from a foot-note, in which he says,[3] "The first edition [of Bennett's 'Principles and Practice of Medicine'] was published in London in 1852. Through the courtesy of Mr. George Bullen, of the British Museum, I am informed that Fig. 70 of the second edition is found as Fig. 89 on page 218 of the first edition, and Fig. 172 of the second edition as Fig. 92 on page 219 of the first edition. Thus it is proved," says Garrigues, "that Bennett has known these bodies before Beale's first edition was published (1854)." From this we might infer that Beale had also described these cells, but in another place [4] I have shown that Beale, like other observers, never recognized the true nature of this cell, that his description of it was inaccurate, that no claim was made by him that it was peculiar to this fluid, and that he gave no test to distin-

[1] *Surgical Pathology*, p. 775.

[2] *American Journal of Obstetrics*, January, 1882, p. 38.

[3] *Ibid.*, p. 38.

[4] *Transactions of the American Medical Association*, 1873, vol. xxiv., p. 182.

guish it from other granular cells. Thus all of Dr. Garrigues' laborious attempts to prove that Bennett described these cells, either in 1852 or at any other time, fail, as it has been shown by Bennett's own words that he never even alluded to them.

Having now proved from the evidence which has been adduced, —

1. That the bodies found in ovarian fluid and described as ovarian cells *are cells* and *not nuclei*, and that, from the nature of their origin, they are diagnostic of this fluid ;

2. That they are easily distinguished from the pyoid bodies of Lebert by what he describes as their "*essential character*," *their yellowish tint ;*

3. That John Hughes Bennett never referred to these bodies in his writings, nor represented them for the purpose of description in his drawings, —

It follows, that Dr. Garrigues' statements in regard to these points being proved to be erroneous and without foundation, his conclusions, "That these bodies are not pathognomonic of ovarian nor any other cyst, as they may be found in various parts of the body," and "That there is no pathognomonic morphological element in the fluids of ovarian cysts," are entirely destitute of value.

There are some other statements in regard to the ovarian cell in Dr. Garrigues' paper which may be briefly alluded to. The first is that concerning the tests which I have recommended to distinguish it from other cells. He questions their practical value. To the acetic acid test, he objects that it is the same as that used by Lebert to distinguish his pyoid cell, but, as Lebert states that this is never found except in pus, and as the color of this cell is sufficient to identify it, the objection is groundless. But it may be here remarked that cells, which have some resemblance to the ovarian cell, are occasionally met with which remain almost unaffected by acetic acid, and are far better calculated to deceive than Lebert's. I would, therefore, put observers on their guard against them. For instance, the cells which I have described as being found in ascites may

also be present in other fluids, but a close study of them will show that in appearance they differ so materially from the ovarian cell, that a careful observer cannot mistake them. As they have been already treated of in this paper it is unnecessary to say more about them now.

In addition to these cells we sometimes meet with pus cells, which have been retained in collections of pus in the body for a long time, and have undergone fatty degeneration. These do not become transparent and show their nuclei when acetic acid is added to the fluid, and consequently may be mistaken for the ovarian cell, but their uniform size, and the comparative dullness or paleness and want of clearly defined outlines of the granules, will help to distinguish them ; besides, it is exceedingly rare to find all the pus cells thus changed. Generally, a sufficient number remain which show their true character on adding the acid, and thus put us on our guard. Should there, however, be any doubt in regard to the nature of the cell, the observer may distinguish them from the ovarian cells by first adding acetic acid, and following it by ether. Under this treatment the pus cell, which has undergone fatty degeneration, is dissolved, while the ovarian cell remains comparatively unaffected.

The test which I recommended to distinguish the ovarian from Gluge's or Bennett's cells is ether. Dr. Garrigues says he has found this a difficult agent to use, but his experience differs from my own. If a small quantity of ovarian fluid is put on the glass slide, and a few drops of ether added, and mingled with it by means of a tubular pipette, and the cover at once put on, there is but little more difficulty with this than with any other reagent. A few drops of ether occasionally applied to the edges of the cover will keep the specimen immersed long enough to discover its effect upon the cells.

In another place I have stated that "the ovarian granular cell remains nearly unaffected by it, or, at most, has its granules made paler, while the cell of Gluge loses its granular appearance, and sometimes entirely disappears

through the solution of its contents by the ether."[1] To this statement, Dr. Garrigues objects. He says, "When ether is added we see some of Bennett's corpuscles almost dissolved, but other corpuscles of the same kind are not affected at all, probably because they have not been reached by the ether, which mixes with great difficulty with the colloid fluid."[2]

This objection has but little weight, for if a sufficient number are acted upon to show their true character, the evidence is sufficient. But, he adds, "Drysdale's corpuscles are affected in the same way as the large granular cells. They become pale, their contour becomes irregular, their granules disappear, they shrivel and seem to become dissolved. Thus ether affects both kinds of bodies or none at all." This differs entirely from my own experience. I have never seen ether produce such an effect on the ovarian cells, nor do I perceive how it can. Gluge's or Bennett's cells are epithelial cells which have undergone fatty degeneration. In other words, they are almost wholly converted into fat, which is soluble in ether, while the ovarian cell is an aborted epithelial cell, composed mainly of protoplasm, including in it minute globules of fat, the greater number of which are protected from the action of the ether by this albuminous covering. Of course, a few of them may be so far advanced in fatty degeneration as to be acted upon in the same manner as the cell of Gluge, but the majority of them are no more affected than has been stated. I maintain, then, that my description of the action of this test is correct, but this question can be readily settled by the further examination of the matter by other observers.

The last statement of Dr. Garrigues which I shall notice is, that "Drysdale's corpuscles seem to have a little more value than Bennett's, but they are by no means pathognomonic, not even of the presence of any kind of cyst, and still less of an ovarian cyst."[3] "I have," he says, "found

[1] *Transactions of the American Medical Association*, 1873, vol. xxiv., p. 181.

[2] *American Journal of Obstetrics*, January, 1882, p. 24.

[3] *Ibid.*, January, 1882, p. 35.

them in one of my cases of cyst of the broad ligament, in a case of suppurating cyst of the abdominal wall, in the above mentioned case of cancer of the peritoneum, in a case of renal cyst, in a congestive abscess extending from the spine to the femur, and in a vaginal cyst. Similar observations have been made by others. Dr. A. Erich, of Baltimore, has found these corpuscles in a case of encysted ascites. They were likewise disclosed to be present in a case of Dr. J. Byrne, of Brooklyn, which turned out to be hob-nailed liver with ascites. On the other hand I have missed these corpuscles in cases of simple ovarian polycyst, in another where the cyst wall showed cancerous degeneration, and in a case of sarcomatous cyst."

The assertion that he has found the ovarian cells in cysts of the broad ligament carries no weight with it, and needs proof, for in his twenty-third conclusion he makes the positive statement that "cysts of the broad ligament cannot be distinguished from those of the ovary," [1] and again, "as to cysts of the broad ligament, I do not know of any character by which they can be distinguished from ovarian." [2] In another place he asserts, "It is impossible to tell, by the fluid alone, if a tumor is ovarian or a cyst of the broad ligament." [3] Now if the cysts cannot be distinguished, and if the fluids are identical, how did he know that these cysts which he describes as those of the broad ligament were not ovarian ?

After such statements he should at least make it evident how he identifies these cysts, and that he has not mistaken an ovarian monocyst for one of the broad ligament, else his assertion that he has found the ovarian cell in cysts of the broad ligament is valueless. Observe, also, the discrepancy between these conclusions and a former statement in which he says, "There are two ways in which we can tell a cyst of the broad ligament from an ovarian cyst : one is the fact that we find the ovary beside the tumor, and the other is the

[1] *American Journal of Obstetrics*, July, 1882, p. 672.
[2] *Ibid.*, January, 1882, p. 37.
[3] *Ibid.*, April, 1882, p. 396.

character of the outer epithelium. A tumor covered with columnar epithelium is ovarian, and cannot be anything else, while the cyst of the broad ligament, being covered with peritoneum, has flat peritoneal endothelium." [1] As he does not state that he found the ovary beside the tumor in either of the cases which he describes, he must have relied upon the character of their epithelial coverings to distinguish them. Here is a very simple test which, if it proved reliable, would be conclusive, but it has proved fallible even in his own hands. The history of a case of the removal of an abdominal tumor will be found recorded in the American Journal of Obstetrics, October, 1881, page 876. This tumor, Dr. Garrigues, basing his diagnosis upon the character of the epithelium found upon its outer surface, pronounced a fibro-cystic tumor of the ovary. But Dr. Thomas, the operator in the case, stated that it was a fibrocyst of the uterus, growing almost exactly from the fundus of that organ, and showed that "it had no attachment whatever except to the fundus of the uterus." The test, then, is not conclusive.

But, leaving these contradictory statements out of the question, that he is not familiar enough with these cysts and their contents to warrant him in making such positive assertions may be inferred from his own words. He states that he has examined the fluid of *three* cysts which were removed by operation, but only *two* of the cysts. He further gives in his list of tapped cases ten, which he entitles fluid from "cysts of the broad ligament or ovary," or, in other words, doubtful. Yet from these few examinations, fortified by the opinions of various other observers, he arrives at the conclusion, which he has had printed in italics, that "*it is impossible to tell by the fluid alone if a tumor is ovarian or a cyst of the broad ligament.*" Having had considerable experience in the examination of these fluids and cysts, I can assert with the confidence lent by that experience, that all of these conclusions are unfounded, and that cysts of the broad ligament can be distinguished from ovarian by the fluid

[1] *Ibid.*, April, 1882, p. 392.

which they contain. This fluid I have described, in a former article, as perfectly colorless, transparent, and thin, like pure water. Its specific gravity is very low. Under the microscope a few epithelial cells are sometimes discovered in it, but generally it proves to be free from objects. I regard it as peculiar to cysts of the broad ligament as I have never found it in any other abdominal cyst, and further, in the examination of ninety-seven specimens of it, I have never met with the ovarian cell in an uncomplicated case.

But there is another variety of these growths in which an ovarian element adds to the difficulty of diagnosis. In these cases I have found the ovary incorporated in the wall of the broad ligament cyst, and, having itself undergone cystic degeneration, discharging its contents into that of the broad ligament. In this manner a tumor which commences as a cyst of the broad ligament may apparently be converted into an ovarian tumor, and lead the operator to suppose that his first diagnosis, based upon the character of the fluid, was erroneous. Case XXXIII., in Dr. Atlee's book on diagnosis, gives an excellent example of this complication, and I have met with a number of other instances of the same kind. For this reason a mistake is easily made by an inexperienced observer. Case LI., described by Dr. Garrigues as a multilocular ovarian cyst with watery fluid and ciliated epithelium, which he uses as a proof that this colorless, watery fluid can be found in an ovarian cyst, has every characteristic of a broad ligament cyst with the ovary intimately attached, and spread over its wall. In his description of the cyst, he says, "At the bottom of the main cyst was found a finger-thick solid mass, a development of the ovary." In his cases V. and XI., where he discovered the ovarian cell in the fluid, an ovarian element was probably present. Seeing, then, how readily a mistake might be made by one having but a limited experience in these cases, and having shown by his own words that he is unable to distinguish a cyst of the broad ligament from an ovarian cyst, but little importance can be attached to Dr. Garrigues' statement that he has found the ovarian cell in cysts of the broad ligament.

Dr. Garrigues tells us that he has also met with a cell resembling the ovarian cell in cysts of the kidney. This agrees with my own experience. In Dr. Atlee's work, page 140, will be found a description given by me of a fluid from a renal cyst, which reads as follows : " It was of a dirty light-brown color. Its specific gravity was 1.020. Its reaction was alkaline. Under the microscope it was seen to contain plates of cholesterin, coagulated fibrin, blood-cells, oil globules, and great quantities of granular cells, which, in appearance, resembled those found in ovarian fluid." Another specimen of the fluid, passed a few days later, was examined, and found to contain less cholesterin, and but few granular cells were present. Casts of the uriniferous tubes and crystals of uric acid were also discovered in the specimen. In these renal cysts, then, can be occasionally found cells which cannot be distinguished from the ovarian cell. It forms the only exception that I know of to the rule that the ovarian cell is diagnostic of ovarian fluid.

In the examination of these fluids for the purpose of diagnosis this exception must be borne in mind. But, fortunately, the exception is not such an important one as at first sight might appear, and for the following reasons: Renal cysts seldom attain such a size as to be mistaken for ovarian, and are rare in comparison with them, for in over two thousand specimens of abdominal fluids examined by me, but four were renal, and of these, but one contained this granular cell. The other characters of the fluid of these cysts are generally sufficient to distinguish it from that of ovarian disease, and if any of the constituents peculiar to urine are found in any quantity in the fluid, or if, as in the second specimen from the above mentioned case, casts of the uriniferous tubes are present, they will point out its true nature. In addition to these peculiarities the history of the case will usually indicate the origin of the cyst.

Dr. Garrigues also says that he has found the ovarian cells in a case of suppurating cyst of the abdominal wall, in a case of cancer of the peritoneum, and in a congestive abscess. These were all met with in accumulations of pus, and

are therefore unreliable. The fluid in the cases of Drs. Erich and Byrne, and in the vaginal cyst mentioned by Dr. Garrigues, are just the ones in which are found the cells which I have described as existing in ascitic fluid, and which have been so frequently mistaken for the ovarian cell. It requires a practical familiarity with all of these cells to distinguish one from another, for just as mistakes are made in the diagnosis of ordinary diseases for want of care in the examination of their characteristics, and want of practical familiarity with them, just so will mistakes occur in the diagnosis made by means of the microscope. Are we to condemn auscultation because many fail to recognize the sounds which indicate morbid changes? Would it not be equally absurd to condemn this sign of disease, indicated by a cell, because some observers have failed to identify it or have mistaken another cell for it?

And last, Dr. Garrigues states that he has missed the ovarian cells in a simple ovarian polycyst, in another where the cyst wall showed cancerous degeneration, and in a case of sarcomatous cyst. In the first, judging by the description of the growth, a cyst of the broad ligament was mistaken for an ovarian, and in the other, the cancerous degeneration in the wall of one, and the pathological character of the other, would account for the absence of these cells.

Having answered the statements of Dr. Garrigues in regard to the ovarian cell, I will briefly reply to the remarks made by Dr. Noeggerath during the discussion of the paper.[1] Dr. Noeggerath spoke as follows: "I would say a few words regarding the so-called ovarian corpuscle, which Dr. Drysdale considers characteristic of ovarian cysts, and Dr. Garrigues does not. I think the position which that question occupies is illustrated by the following incident: I sent a specimen to two of the best men in the country, whose names are connected with this subject, and they both sent me back the answer that it contained the ovarian corpuscle, and was, no doubt, the result of an ovarian tumor. Now what were the facts? The specimen was taken from a

[1] *American Gynecological Transactions*, 1881, vol. vi., p. 85.

suppurating cyst of the thigh, and yet it contained the ovarian corpuscle in such numbers, and in such perfection, that the best judges in the country mistook them for it." I inquired if Dr. Noeggerath had sent me one of the specimens. He replied, "I did." This requires explanation, which would then have been given had I had the necessary evidence with me.

I hold in my hand three letters from Dr. Noeggerath. The first [1] asking me to send him another copy of my paper on the ovarian cell, as he had loaned his to a friend. The copy was sent. This shows that he was familiar with the paper. In that paper it is distinctly stated that my remarks apply only to fluids removed from the abdomen. For instance: "This cell, when found in *this location*, I believe to be pathognomonic of ovarian disease, not meaning to assert that a cell having a similar appearance may not be found in cysts met with in *other parts of the body*;" and, again, it is spoken of as a "granular cell which differs in its behavior with acetic acid and ether from any other known granular cell *found in the abdominal cavity*." Now, asking you to bear these words in mind, I will state what occurred.

Dr. Noeggerath sent me a bottle of fluid, and with it this note: —

NEW YORK CITY, 42 WEST 35TH ST., 5, 5, '81.

MY DEAR DOCTOR, — I herewith send you a specimen fluid, drawn from a tumor, the origin of which is obscure. It looks to me as if it contained a large amount of ovarian corpuscles. Would you please examine, and let me know.

Some of the crystals are probably from the addition of thymol. Truly yours, E. NOEGGERATH, M. D.

The fluid was examined, and my doubts about its being

[1] The following is a transcript of this letter: —

DEAR DOCTOR, — Will you permit me to ask you the favor of sending me another copy of your paper on the ovarian corpuscle. I lent my copy to one of my confrères who failed to return it after he left the city.

Have you made any addition to the subject since the publication of your pamphlet? I am, yours truly, E. NOEGGERATH, M. D.

NEW YORK, 42 W. 35th Street, *October* 20, 1879.

ovarian were so decided that I wrote to Dr. Noeggerath, and asked him if the fluid had been removed from a tumor of the abdomen. I received this reply: —

My dear Doctor, — If I did not mention the fact that the tumor in question came from the abdomen, it was because I thought you knew that I am a specialist, only dealing with matters connected with the female genital organs.

Truly yours, E. Noeggerath.

Supposing that Dr. Noeggerath was an honorable man, I took it for granted that his statement was true, and applied no further tests to the fluid. By this deception he obtained the reply that the fluid was ovarian. The facts are before you, and speak for themselves. In the letter to me, he states that the fluid was from an abdominal tumor. To the Society, he says it was from a suppurating cyst of the thigh. Comment is unnecessary.